Critical Decision Points for a Selenium Ecosystem Scale Model

The table below states the main steps to develop a Se Ecosystem Scale model. The Driver is indicative of the creation of the model and not of using the model to calculate a protective water column concentration.

Decision	Driver	Public Participation process /date	Documentation of Decision
What Fish Species will be protected?	Policy/science	First process/Sep 2018	
What taxonomic rank do we use for decisions? Species level? Genus level?	Policy/science	First process/Sep 2018	
What is our desired level of protection? 95%; 90%; 50%, etc. at what steps is this applied and does it differ at the different steps?	Policy/science	First process/Sep 2018	
Egg-Ovary final chronic value	Policy/Science	First process/Sep 2018	
Egg/ovary Concentration	Data**	Second process/August 2019	
Species Egg-Ovary to Whole-Body Conversion Factor AND muscle to whole body CFs	Calculation/literature?	Second process/August 2019	
Fish Whole Body Concentration	Data	Second process/August 2019	
Species Trophic Transfer Function	Calculation/literature	Second process/August 2019	
Invertebrate Concentration	Data	Second process/August 2019	
Species Trophic Transfer Function	Calculation/literature	Second process/August 2019	
Concentration in Particulate Material	Data	Second process/August 2019	
Kd	calculation	Second process/August 2019	
Water Column concentration	Data	Second process/August 2019	

** Most data collected decision points can also be informed by literature values, often found in a concise manner in the EPA selenium criteria document, 2016.

Se Technical Subcommittee (SeTSC) Timeline- From the inception of the SeTSC to the predicted criteria adoption. Version 1: 2_16_2018

The Action, in the pink column, is the step taken toward Se criteria development. The response is what resulted from the action. And the Goal, Document and Date tabs support the action. All Se-data mentioned below with the exception of late 2017/2018 data have been entered into a Se spreadsheet found on the wiki site: [HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/file/122234754/Koocanusa%20Se%20concentrations_updated%20Oct12.xlsx"]

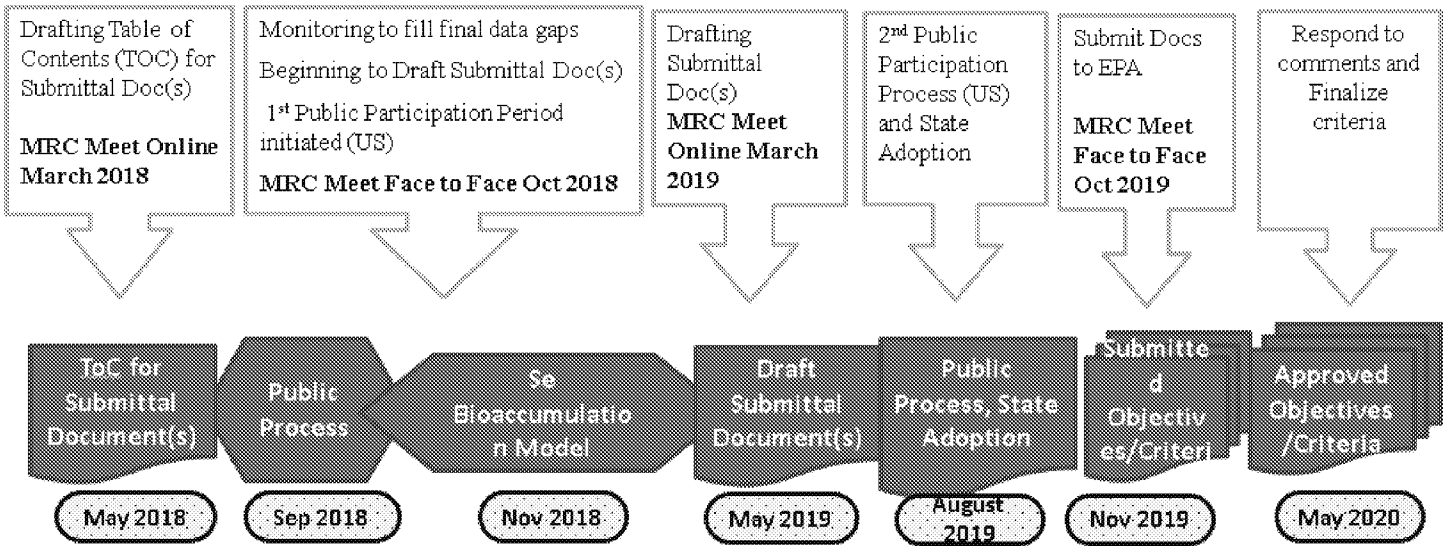
Action	Response	Goal of action	Document	Date/results
2015 USGS/EPA/DEQ K_d study on LK			SAP on Wiki under 2015_SAPs and results in SciBase	2015
Written recommendations to SC (via co-chairs) about process toward selenium criteria/objectives development (suggested deadline of December 04, 2015).				
Selenium Technical Subcommittee (SeTSC) Formed	initial members: David Janz, David Naftz, Theresa Presser, Lana Miller, Joe Skorupa, Joe Beaman	Answer the Q is the current Canadian Se target of 2 ug/L protective of the uses of LK and if not, what is an appropriate target value for Se in LK?	Email	12/22/2015 – invite sent
Lake Koocanusa Monitoring and Research Working Group (LKMRWG) Terms of Reference Created			Posted (wiki) online under meeting materials for 2/2016 meeting [HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/browse/" \l "view=ViewFolder&param=Pre-reading%20and%20Handouts%20-%202_3Feb2016"]	12/2015 – Draft distributed pre-2/2016 meeting for review
SeTSC draft Statement of Work sent to committee for discussion/feedback			Posted (wiki) online under meeting materials (see link above) for 2/2016	1/20/2016 to SeTSC for review

2016 LK Se Project Proposals	Sent to SC for approval/funding	To form monitoring goals for 2016	All monitoring projects have associated SAPs/plans that can be found in the link below:	From 2/2016 meeting in Helena Mt
	Kd study 2016	Increase certainty in Kd values across the reservoir	[HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/browse/" \l "view=ViewFolder&param=2016_Sampling_and_Analysis_Plans"]	USGS data found in [HYPERLINK "https://www.sciencebase.gov/catalog/item/58ecf623e4b0b4d95d335366"]
	Se speciation of water at the outflow/forebay of LK	Determine speciation (tox) of Se exiting LK Inform on possible downstream effects	ACE PowerPoint Cranbrook results: 2015 USGS in reservoir results (Scibase)	
	Burbot sampling (US portion)	Selenium status of declining Burbot population	[HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/file/117094707/2015_16DEQ_FWP_LK_Se_Burbot_Muscle.docx"] and Equis	2015/2016 burbot muscle samples
	Bird reconnaissance Opportunistic sampling of bird eggs around LK	Determine appropriate endpoint of model	Pending doc	Ongoing: final report expected ~ May 2018 (uncertain)
	Benthic invertebrate	Because of the sparsity of benthic inverts in LK, work by Teck was to be reviewed	Future determination of if this work is needed is ongoing	
	Selenium in zooplankton	Determine [Se] in food web: how Se is moving up the food chain, specifically via plankton.	USGS-collected/ScienceBase USACE-collected/EQuIS	
	Stream grab sampling	Determine Se inputs to LK	EQuIS, Cranbrook Presentation	
Se Modeling Framework Initiated for LK	Solicit Jenni (USGS) to develop Se model framework	Develop a model framework to support the development of site-specific Se criteria for LK	[HYPERLINK "https://www.usgs.gov/news/usgs-releases-selenium-modeling-framework-montana-and-british-columbia-s-lake-koocanusa"]	5/26/2016 contract Deliverables 10/25//2017 meeting.

List of fish to focus on chosen by the SeTSC	About 10 fish were identified as being of high interest to the SeTSC	To narrow down our focus (data needs etc.) for the model	Found in Cranbrook notes	10/2016
2017 LK SeTSC project needs		To form monitoring goals for 2017	[HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/browse/" \l "view=ViewFolder&param=Meeting%202_October%202016"]	Details found in Cranbrook notes 10/2016 Email sent to SC 12/8/2016
	State of the Lake report	Desktop review of all LK data in one place		Contract initiated 5/2017
	Kd + Canadian site	Third year of Kd values with the addition of a Canadian site for comparison	[HYPERLINK "https://www.sciencebase.gov/catalog/item/58ecf623e4b0b4d95d335366"]	Results posted to Science base see link to left 6/1/2017: 2017 data pending
	Fish tissue with tissue collected to calculate conversion factors (CFs) where possible	Fish tissue status CFs to translate from egg/ovary: muscle: whole body for Se model	[HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/browse/" \l "view=ViewFolder&param=2017_Sampling_and_Analysis_Plans"]	Data analysis ongoing
	Fish stomach analysis	food web spot check for Food web report	[HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/browse/" \l "view=ViewFolder&param=Fish_Results"]	
	LK food web visual/report needed	Create a food web and report using available data for LK	[HYPERLINK "http://lakekoocanusaconservation.pbworks.com/w/file/116323853/Lotic_Environmental_Lake%20Koocanusa%20Food%20Web_FINAL%20%283%29.pdf"]	Proposal 1/2017 final project Deliverables: March 2017
	Zooplankton analysis	Continuation of 2016 plankton analysis for food web Se concentrations		
	Macroinvertebrates	-------	Possibly for 2018	
Committee agreed that Joe S's toxicological endpoint derivation is appealing	Requested a write-up on the method	Chose a tox endpoint to be used in model	Tox endpoint write-up priority see below	Kalispell meeting Oct 18th 2017 – notes Deliverable May 2018 (uncertain)
Committee agreed that fish are the	Requested bird write-up from Joe S for support	Choose fish as the appropriate	Bird write-up see priority below	Kalispell meeting Oct 18th 2017 – notes

appropriate endpoint		endpoint for model		Deliverable May 2018 (uncertain)
Committee agreed that food web appears to be relatively stable	Adding data as we go is appropriate	Continue fish stomach analysis where possible	Append Lotic Food Web?	Kalispell meeting Oct 18th 2017-notes
Site-Specific Conversion Factors (CFs) for LK appear higher than those published in EPA Se doc (2016)	Further collection of tissues and site-specific analysis of CFs is warranted	Priority for 2018 to collect target fish tissue for CF development-where possible.		Kalispell meeting Oct 18th 2017-notes
2018 Se TSC priorities	See 2018 Priorities below:	To form monitoring goals for 2018		Details found in SeTSC Meeting 3: waiting for comments will post to Wiki soon.
	Bioavailability in particulates	Determine if further analysis of Kd is needed	Data analysis report 2015-17 and how it fits in model, based on that further analysis may be recommended.	Spring/Summer 2018
	Invertebrate sampling US Side Coordinate with FWP on a large-scale benthic effort	Determine benthic Se concentrations in LK		SAP in progress:
	Large-scale fish monitoring effort (2008, 2013 continuation) at 2/3 Sites Coordinate with FWP to determine sites/tissues/etc	To determine fish tissue Se status, with focus on fish chosen as Key model species.		SAP in progress
	Skorupa bird write-up	To support fish as the appropriate model endpoint for Eco. Se Toxicology	Expected May 2018	Update Feb or March 2018
	Skorupa fish tox endpoint write-up	To support Joe S. statistical determination of a tox endpoint in the absence of complete tox data.	Expected May 2018	Update Feb or March 2018
	Conceptual Model w/ LK Data	To validate the model using LK data &		EPA/USGS contract for this work.

		determine a Se water column concentration in LK that is protective of aquatic life		
	Se criteria/objective report table of contents/outline	To begin drafting material to support adopting Se criteria/objective		
Future Questions/Timeline				
Choose several key species to model	Need to focus 2018 tissue collection on filing data gaps	This will enhance the CFs as well as increase data on key fish and enable more accurate modeling		Feb, 2018
Benthic values	Is it consistent from US/Canada	This will give us more accurate TTF values for LK		Results Dec, 2018
Species or genus level protection				Spring, 2018
What is the level of protection and where is this number applied?		Different final conservation levels depending what value is chosen for each step		Spring, 2018
Does the model validate with our current data?				Spring, 2019
What is the back calculated protective water column concentration?				Spring, 2019
Criteria document write up				Fall 2019
Internal Agency Reviews				Winter/Spring 2020
Stakeholder input				
Finalize Reports				Spring 2020
Approval				Spring 2020


Drafting Table of Contents (TOC) for Submittal Doc(s)
MRC Meet Online March 2018
Monitoring to fill final data gaps
Beginning to Draft Submittal Doc(s)
1st Public Participation Period initiated (US)
MRC Meet Face to Face Oct 2018
Drafting Submittal Doc(s)
MRC Meet Online March 2019
2nd Public Participation Process (US) and State Adoption
Submit Docs to EPA
MRC Meet Face to Face Oct 2019
Respond to comments and Finalize criteria
ToC for Submittal Document(s)
Public Process
Se Bioaccumulatio n Model
Draft Submittal Document(s)
Public Process, State Adoption
Submitte d Objectiv es/Criteri
Approved Objectives /Criteria
May 2018
Sep 2018
Nov 2018
May 2019
August 2019
Nov 2019
May 2020